

Progress Report

A Prediction of the Nature of
the Future R&D Program

By

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for

R&D Management Control Methods Study

Submitted by:

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NGA Review
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TO: P&DS Monitor

We present here a prediction of the nature of the R&D effort over the next three or four years. The plan of R&D control methods must be tailored to the kind of program to be carried on.

Our prediction will establish the type of R&D program for which our R&D control methods will be suited. We must make a prediction of this kind before proceeding; it is a proper part of the study. You as monitor do not necessarily indicate acceptance of the accuracy of our prediction if you approve this report. You do indicate that you approve of the direction in which the study is proceeding. We would appreciate your comments but none are necessary if you believe our work to be properly directed.

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Summary

We define "prime contractor" and analyze the effect of each required characteristic, and predict:

Larger contracts will tend toward poorer results.

P&DS has an impossible task in defining the program goals in terms understandable to contractors, so the contractor will not understand the operational problems of NPIC. This in spite of needing more, not fewer, monitors to guide contractors and control programs.

The amounts of work subcontracted will be small, and few consultants will be used.

P&DS will find it necessary to perform just as much project surveillance and monitoring as before to assure good results. In addition, P&DS will spend much time guiding contractors.

P&DS monitors will be required to have just as much detailed knowledge of projects as before in order to approve or disapprove project decisions.

Program contractors will not be able to anticipate acquisition and exploitation demands.

The "prime contractor" concept is opposite in direction and effect to DoD's Project Definition Phase concept, which has been found to give better weapons at less cost. By implication the Center will have poorer results at greater cost.

25X1 seems similar to "prime contracts" and some poor results here can be ascribed to poor communications because of complexity of information to be conveyed.

The "prime contractor" type of contract will disappear.

We will provide control methods which recognize the present existence of "prime contracts", but which will anticipate their disappearance.

Definition of the "Prime Contractor" Concept:

First, the term "prime contractor" as used in the Center is different from its meaning as used in the Department of Defense. A "prime contractor" will

(a) Usually have a larger amount of money attached to his contract than the average amount in the past;

(b) Be expected to plan a program of research and development consisting of a group of related projects directed toward a common goal;

(c) Carry on the work of some of the projects;

(d) Have the broad capability necessary to plan and carry out a program requiring the employment of many scientific disciplines;

(e) Employ consultants with unique capabilities as needed when the contractor has no one with the required capabilities available in its own organization;

(f) Subcontract work of any kind to other contractors when the "prime contractor" does not have the necessary capabilities, equipment, skills, financing, or manpower to carry on the program;

(g) Carry out surveillance and monitoring activities for the complete program and report to the Center's monitor in such a manner that will reduce the time required to be spent by the Center's monitor;

(h) Submit the decisions of a major nature to the Center P&DS for approval. The decisions should include but not be confined to

(1) work statements for projects,

(2) the breakdown of the program into projects,

(3) time schedules of projects and changes in time schedules,

(4) budgeting of funds for the various projects and changes in the allocations,

(5) redirection of projects or change in work,

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(6) for each project, the decision as to whether the "prime contractor", a sub-contractor, or the Center should perform the work.

(i) plan the program and modify it as necessary to manage all aspects of the program so as to anticipate the effects of advances in acquisition systems and exploitation requirements.

A contractor expected to have the characteristics listed above and perform in the manner listed above will be defined to be a "prime contractor".

Analysis of Likely Effects of Each Requirement Placed on the Contractor by the "Prime Contractor" Concept:

The analysis is keyed to the definition by the lower case letter at the start of each section.

(a) Larger contracts -- We cannot document the following assertion because we have not taken the time to evaluate all past Development projects. However, we believe that analysis would show that, in the past, those projects with the larger amounts of money have been less successful than the smaller projects. It is true that monitoring and surveillance activities have not been required in past contracts and will be required in "prime contracts". However, we will demonstrate in section (g) that such self-monitoring will be ineffective. So the larger size of contracts will tend toward poorer results.

(b) Contractor plans and manages program -- Many contractors will be able to plan a program of research and development. The Center has correctly assessed its first role as being the conveyor of information defining the common goals of each research and development program to the bidders but more importantly to the successful bidder over the entire length of the contract.

We believe that P&DS has an impossible task in defining these goals in terms understandable to contractors. An example of the difficulty is contained in "Modulated-Light System Program Information Sheet" dated 4 November 1965. The Information Sheet is designed to give each potential contractor the common goals of the program.

We quote from paragraph 2.7. ". . . guidelines will be given to delimit areas of prime concern. The basic rule is to limit research to those areas which promise answers to actual operational problems of NPIC. . . ."

This is an impossible basic rule for any contractor to follow. No contractor can know "the actual operational problems of NPIC". P&DS within NPIC is a full time group dedicated to knowing these actual operational problems, and it is constantly criticized by the operating components for "not knowing our problems".

Whether this criticism is valid or not is immaterial to the problem of the "prime contractor". He cannot know the operational problems if even the state of the knowledge of P&DS is suspect.

So it devolves upon P&DS to state the operational problems to the "prime contractor". An example of such an attempt is the two documents:

(1) Modulated-Light System Program Information Sheet, dated 4 November 1965.

(2) Research and Development Program Objectives dated 5 October 1965.

We believe these to be a fair test of the difficulty of the task of defining goals for a program.

In those documents, only the first paragraph of Section 3 of the first document treats the operational problems of NPIC. We quote from this paragraph. ". . .the central technical requirement. . .is. . .that all of the information the picture contains is made visible."

We certainly can conceive of some system of scanning the photographic image with infrared or ultra-violet light in order to amplify the slight differences in film density. (Very high resolution scanning methods with infrared are being used by the Navy). And indeed, the author of the above documents suggests "converting the image to an electronic signal" in the second listed document. However, the title "Modulated-Light System Program" would seem to rule out such directions for research. Also the equipment suggested by the author in the above documents includes only modulated-light printers, enlargers, light-tables, and viewers. There is need for gigantic amounts of clarification for the contractor and it must be communicated by the monitors.

So huge amounts of time will be required from the monitors to guide the contractors. The time required is likely to be so great that more than one monitor will be needed per contractor, with the monitors spending half of their time at the contractor's plant and half their time at NPIC. Rather than reducing the

number of monitors required, the "prime contractor" concept will probably require more monitors.

Also, if the monitors must spend long times away from Washington, travel visits for NPIC will rise, and monitors will be spending more time away from home. Such a change will produce unhappy monitors and a possible loss of monitoring personnel.

(c) Performs directly on some contracts -- We can claim to be completely familiar with contractor's attitudes. Not only will "prime contractors" carry on some of the projects themselves, they will carry on all of the projects themselves. Only when ordered to do so or when the project promises to be unprofitable will the "prime contractor" subcontract out a project, and then only after an agonizing "make or buy" decision process.

So the number of subcontractors and the amount of dollars subcontracted will be small.

(d) Have broad capability -- No comment

(e) Employ consultants -- Since we are consultants, we probably should disqualify ourselves from comment, but we won't. No prime contractor with "broad capability" will admit very often that no one exists on its staff or that no one can be hired as an employee who will have the unique capabilities. So few consultants will be used. Maybe this is good?

(f) Subcontract work -- Same comment as for (c)

(g) Perform surveillance and monitoring -- The government in every phase of its weapons acquisition process has found it absolutely necessary to carry out a surveillance and monitoring activity itself.

The Army and the Navy insist on the right of approval over any significant program, test, or action of the contractor. The Air Force has relaxed somewhat in retaining only the right of disapproval of a program, test, or action but its contract management people have offices located within the plant in many cases and sample his programs and procedures in a routine planned way.

In a few cases, the government has contracted out the surveillance activity to an independent contractor. An example is The independent contractor performs the surveillance for the Air Force over other contractors and reports

back to the Air Force. But in no case has a contractor been permitted to monitor itself.

It may be that the P&DS does not see this requirement as permitting the contractor to monitor himself. But if less time is to be required of the monitor than at the present time, the net effect will be that the contractor will monitor himself.

Self monitoring will not work, witness the existence of umpires and referees. The P&DS monitors will quickly find the demands on their time for monitoring will be as great or greater than before. So there will not be a decrease in the number of monitors required per dollar contracted.

(h) Submit decisions for approval -- P&DS here retains control over the program and projects. To exercise wise control P&DS will require just as much detailed knowledge of the individual projects as is required at present. Such detailed knowledge will be demanded for correct approval or disapproval. Note that decisions will mostly relate to projects, not programs, so detailed project information is required.

So the time required of the monitors will be the same for each project whether or not they are grouped under one "prime contractor". Ten projects with ten different contractors will require no more monitoring time than ten projects grouped under one "prime contractor". Decisions to be made will relate to each project and in both cases the monitor will have to be familiar with ten projects.

There will be one saving of monitor's time which will occur. Because of the reluctance of the "prime contractor" to give anything away to subcontractors, it is likely that all of the ten projects mentioned above will be worked on at one location with a consequent reduction in monitor's travel time. It is not NPIC's intention that this be true, however.

So P&DS will be on the horns of a dilemma. If control is maintained over projects, no reduction in monitoring manpower requirement will result. On the other side, if the monitoring activity per dollar contracted is reduced, control will be lost. Just exactly to the extent that monitoring activity per dollar contracted is reduced will control be lost.

(i) Anticipate acquisition and exploitation demands -- Most NPIC personnel state that P&DS has performed well in the past in anticipating advances and changes in acquisition systems. The contractors do not have available to them the sources of information which are available to the Plans Branch. So the only source of information for contractors about acquisition systems is the Plans Branch of the Plans and Development Staff.

It is our understanding that in many cases security requirements would make it difficult for a monitor to convey information to a contractor from the Plans Branch. Since we don't know all the details because of security restrictions, we are not positive but it seems that, at the least, the monitor will have to spend much more time to make the contractor aware of advances in acquisition systems. At the worst, the contractor will be effectively isolated so that he cannot possibly anticipate the effects of advances in acquisition systems.

In regard to exploitation requirements, the similar comments apply as for the difficulty presented to the monitor by the need to communicate the program goals to the contractor. Much monitor time will be required.

The monitor's time spent helping the contractor anticipate new acquisition systems and exploitation requirements will be in addition to the time demands now made on monitors. More monitors per dollar contracted will be required to perform this additional task.

The Direction of Progress in "Prime Contractor" Concept:

The Department of Defense has strongly recommended, and almost required, a "project definition phase" for all R&D contracts. (The name was changed about six months ago, but the idea is the same.) During the "project definition phase", a contract is written for work by one contractor to perform experimental and predesign planning to establish clearly the performance specifications which can be written into the development contract. After the project definition phase is completed, requests for quotations go out for the development contract.

Prior to establishing this procedure, the U. S. Government was issuing one contract for both categories of work. In fact, there was no general recognition that two categories of work did exist. By breaking the contracts in two parts, the Department of Defense has achieved economies and more effective weapons have been supplied.

It seems to us that the "prime contractor" concept of NPIC goes in exactly the opposite direction from the DoD project definition phase concept. The DoD wants to break contracts into smaller sequential tasks so that evaluation may be made at the completion of each task. NPIC is making contracts larger and longer and will lose the opportunity of frequent evaluation.

The Lesson Learned from Previous NPIC Experience:

It seems to us that the [] is a contract with marked similarities to the "prime contracts" being negotiated now.

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Again, we cannot document the following statements. However, we learned that a report is going back to [] now advising them that the last 3 or 4 projects under [] have been unsatisfactory.

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We have been told of complaints by [] that "NPIC can't tell us what they want". There is good evidence of poor communication between [] and NPIC.

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The "prime contracts" being negotiated will require much more communication both in quantity and degree of sophistication.

It is likely that the communication breakdown between "prime contractors" and NPIC will be even greater than with [] and the results consequently poorer.

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Prediction:

The authors of the "prime contract" concept proposed it as a temporary expedient. The Center does retain the right to dictate with whom individual projects will be contracted.*

We believe that P&DS will gradually abandon the "prime contractor" approach to the R&D process. The need for a larger group of monitors will bring problems of growth and it will become apparent that individual project contracts can be more easily monitored. The loss of control over the R&D process will demonstrate the necessity for contracting each project individually and retaining the monitoring function in P&DS.

We believe that P&DS will find that best results from each project will be obtained if many or most projects are performed by contractors other than the "prime contractor" under contract directly with NPIC. This would mean that, in effect, the "prime contractor" will plan research programs consisting of many projects. But as each project comes up for consideration, many will need requirement definition projects or feasibility projects prior to a development contract. Any or all of these contracts could be negotiated by P&DS

* Ultimately perhaps, this may require refusal by NPIC to fund the "prime contractor" for another year.

with other contractors than the "prime contractor". In many or most cases, such contracts will be found to produce better results if made with other companies than the "prime contractor".

The function of the "prime contractor" will gradually disappear and be taken back by P&DS.

The R&D Management Control Method Study will assume that the control method must fit the task of controlling a large number of R&D contracts with a large number of contractors with all surveillance, monitoring, and controlling to be performed by P&DS personnel within NPIC. The "prime contractor" type of contract currently being negotiated will disappear. We will provide control methods which recognize the present existence of "prime contracts" but which will anticipate their disappearance.